

## **Nova Note # 782 Version 2**

### **Extrusion Twinning**

Hans Jostlein

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#### **Abstract**

NOVA is using 32-cell-wide extrusions to make modules. As a backup, the use of 16-cell-wide extrusions is considered. To save cost on electronics, it is desirable to fashion two 16-cell extrusions into a single 32-cell-wide module. One concern is the possibility of leaks at the common end plates and manifolds.

To find out how this can be done, we have done studies on a smaller existing extrusion shape, i.e. the 3-cell, 5 " x 1" extrusion that was made for earlier work.

We have made assemblies having 4 of these extrusions side-by-side, glued into common end plates.

We have found that a two-step process works. We first edge-glue the extrusions together, and then attach the endplates as a second step.

#### **Assembly Procedure**

In the first step, we edge-glue the 4 extrusions together.

We use approximately 4 ft long pieces.

The full edge is coated with adhesive. The last two inches each end are clamped using small visegrip pliers and 2 " long spreader plates. The extrusions are pushed by hand against the flat table during application of the visegrips.

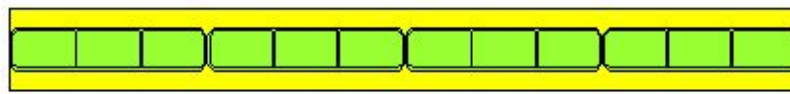
#### **Note on Adhesives**

We have limited this study to using either Magnolia 59-7 or PVC cement for the edge-gluing, and Magnolia 59-7 for attaching the end plates. The latter process does require a tixotropic glue, and I am not sure that we have yet identified other, and stronger, tixotropic epoxies.

We have used unprepared surfaces and also surfaces cleaned with PVC cleaner (essentially Acetone, it seems), Purple PVC primer, and "Magnolia 127" primer that was provided by the company to be used with Magnolia 59-7 on PVC.

#### **Experience with Test Assemblies**

The picture shows a test assembly:



Assembly of four each 3-cell extrusions  
with common end plates  
As a study to understand how to  
"twin" 16-cell NOVA extrusions  
into 32-cell modules

Hans Jostlein  
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We have made six assemblies so far, three of which were successful:

We find that Magnolia 59-7 on unprepared PVC makes a weak bond. Assembly A, made that way, failed with numerous leaks when pressurized to 20 psi. This pressure matches the hydrostatic pressure at NOVA, and is also a practical limit for the thin walled (0.060") 3-cell extrusion.

Assembly B used PVC cement without a primer for edges, and Magnolia for the end plates. It failed with numerous leaks.

Assembly C used sanded edges and Magnolia all around. It was leak free, as checked with water immersion, and was left under pressure for 4 days..

Assembly D used purple primer and PVC cement on the edges, and Magnolia over purple primer for the end plates. We had found that purple primer improves Magnolia adhesion. However on breaking the bond, one finds a sticky residue which seems unattractive. This assembly failed due to air escaping into the edge-glued gap at one spot. We conclude that PVC cement is not suitable. This is consistent with earlier attempts to use PVC cement.

Assembly E used Magnolia over purple primer all around. It is leak tight.

Assembly F used Magnolia 59-7 over Magnolia 127 primer. It is leak tight.

### **Conclusions:**

We have carried out initial studies on assembling multiple extrusions into modules with common endplates.

With proper surface preparation (sanding or priming) reliably leak tight modules can be made.

Once we have 16-cell extrusions we intend to continue these studies.